

The Herald Snakes (*Crotaphopeltis*) of the Central African Republic, including a systematic review of *C. hippocrepis*

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Rasmussen J. B., Chirio L. & Ineich I. 2000. — The Herald Snakes (*Crotaphopeltis*) of the Central African Republic, including a systematic review of *C. hippocrepis*. *Zoosystema* 22 (3) : 585-600.

ABSTRACT

The recent collecting of more than 300 specimens of *Crotaphopeltis* from the Central African Republic not only provides new records of the ubiquitous species *C. hotamboëia*, but also provides records of two other species, *C. hippocrepis* and *C. degeni*, so far unknown for the country. Variation in external and internal characters has been examined in the specimens and the results have been analysed. The analysis of *Crotaphopeltis hippocrepis* has been extended to deal with all available material from the entire distribution area of this little known western African species.

KEY WORDS

Colubridae,
Crotaphopeltis,
Central African Republic,
new records,
systematics,
distribution.

RÉSUMÉ

Les serpents de l'Herald (Crotaphopeltis) de la République centrafricaine, avec une revue de la systématique de C. hippocrepis.

La collecte récente de plus de 300 exemplaires de serpents du genre *Crotaphopeltis* en République centrafricaine permet de préciser la distribution de l'espèce ubiquiste *Crotaphopeltis hotamboëia* dans le pays. Ce matériel comprend également deux autres espèces du genre jamais mentionnées de ce pays auparavant, *C. hippocrepis* et *C. degeni*. Les variations de nombreux caractères externes et internes sont étudiées et discutées. Cette analyse est étendue à tout le matériel disponible pour l'ensemble de l'aire de distribution de la forme d'Afrique occidentale *Crotaphopeltis hippocrepis*.

MOTS CLÉS

Colubridae,
Crotaphopeltis,
République centrafricaine,
nouvelles mentions,
systématique,
distribution.

INTRODUCTION

Crotaphopeltis Fitzinger, 1843 (type species: *Coronella rufescens* Schlegel, 1837 [= *Coronella hotamboeia* Laurenti, 1768] by original designation) is a boigine snake genus with representatives in most of S Sahara, Africa. Six species are currently recognised, i.e. *Crotaphopeltis hotamboeia* with a distribution almost like that of the genus, *C. barotseensis* Broadley, 1968 with a restricted distribution in southern Africa (Rasmussen 1997), *C. braestrupi* Rasmussen, 1985 with an East African distribution (Rasmussen 1985), *C. degeni* Boulenger, 1906 with an East and Central African distribution (Rasmussen 1997), *C. hippocrepsis* (Reinhardt, 1843) with a non-specified West African distribution (Rasmussen 1985) and *C. tornieri* Werner, 1908 with a montane distribution in East Africa (Rasmussen 1993a).

Joger (1990) dealt with the herpetofauna of the Central African Republic and listed four locality records for the Herald Snake (*Crotaphopeltis hotamboeia*). The present material collected by one of us (L. Chirio) and J. L. Tello in 1991-1996 provides many new records of the Herald Snake, and more importantly, these collections include two additional species of *Crotaphopeltis* from the Central African Republic.

Crotaphopeltis degeni was recently recorded from Cameroon (Rasmussen 1997), leaving an obvious gap between this population and the populations in Sudan and Ethiopia. The present findings of this species in the Central African Republic fill this gap.

Crotaphopeltis hippocrepsis was described by Reinhardt (1843) from the Danish settlements at the coast of the present Ghana (Rasmussen & Hughes 1997) but was later synonymized with *C. hotamboeia* by Boulenger (1896). In 1974, Roman described *Crotaphopeltis acarina* from Burkina Faso. This was subsequently synonymised with *C. hippocrepsis* which thus revived (Rasmussen 1985); its distribution, however, remained obscure.

The aim of the present study is to describe the distribution and characterise the variation of *C. hotamboeia* and *C. degeni* within the Central African Republic and of *C. hippocrepsis* within its entire range, following the lines of earlier reviews of its congeners (Rasmussen 1985, 1993a, 1997).

ABBREVIATIONS

- BH Private collection Barry Hughes, London;
 BMNH British Museum of Natural History, London;
 CAS California Academy of Sciences, San Francisco;
 FMNH Field Museum of Natural History, Chicago;
 MCZ Museum of Comparative Zoology, Harvard;
 MHNG Muséum d'Histoire naturelle, Geneva;
 MNHN Muséum national d'Histoire naturelle, Paris;
 MSNG Museo Civico di Storia Naturale, Genoa;
 NMW Naturhistorisches Museum, Vienna;
 SMNS Staatliches Museum für Naturkunde, Stuttgart;
 ZMB Zoologisches Museum an der Humboldt Universität zu Berlin, Berlin;
 ZFMK Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn;
 ZMUC Zoological Museum, University of Copenhagen, Copenhagen.

MATERIAL AND METHODS

The collections of Laurent Chirio and José Lobao Tello (now deposited in MNHN) consist of 239 specimens of *Crotaphopeltis hotamboeia*, 21 specimens of *C. degeni*, and 26 specimens of *C. hippocrepsis* from various localities in the Central African Republic. Some further specimens (23 *C. hotamboeia* and 1 *C. hippocrepsis*) from the area and additional 115 specimens of *C. hippocrepsis* from elsewhere in West and Central Africa have also been available from various museums for the present study. The collection sites for the specimens within the Central African Republic appear in Fig. 1.

The methods employed are outlined by Rasmussen (1993b, and earlier papers). Hemipenial descriptions are only cursory as a more detailed study of the hemipenes has been initiated (Ziegler & Rasmussen in prep.).



FIG. 1. — Map of the Central African Republic showing collection sites; 1, Bayanga; 2, Belemboké; 3, Nola; 4, Gamboula; 5, Banga; 6, Ngotto; 7, Boukoko and La Maboké; 8, Zimba; 9, Bangui; 10, Sogesca; 11, Elim; 12, Ouazoua; 13, Berberati; 14, route de Bossembélé; 15, Boali; 16, Sibut; 17, route de Possel; 18, Bambari; 19, Seko; 20, Bria; 21, Mboki; 22, Paoua; 23, Kouki; 24, Soumba; 25, Bossangoa; 26, Kaga Bandoro; 27, Bangbali; 28, Bamingui; 29, Ndélé; 30, Manovo; 31, Brandji-Préo; 32, Sangba; 33, Bohou; 34, La Gounda; 35, Gordil; 36, Ouanda-Djallé; 37, Delembé; 38, Birao; 39, Dahal Azrak; 40, Am Dafok. Records from Gribingui region, Ouham region, and pays des Abiras are not specified. *Crotaphopeltis hotamboeia* occurs in all mentioned localities. I, sudano-sahelian (savanas) area; II, medio-sudanian (savanas) area; III, sudano-guinean (savanas) area; IV, congo-guinean (forests and savanas) area.

KEY TO THE SPECIES OF *CROTAPHOPELTIS* RECORDED FROM THE CENTRAL AFRICAN REPUBLIC

- 1a. Dorsal scales keeled (at least posteriorly), usually with elongate white specks confined to the edges; usually with a distinct bluish-black mark on temple..... *C. hotamboeia*
- 1b. Dorsal scales not keeled, without white specks; no distinct bluish-black mark on temple 2
- 2a. Subcaudals 44-58 (males), 39-54 (females); maxillary teeth 12-16 + II + 1; temporal mark present (usually chestnut) extending to the lower jaw and covering the last two to five infralabials; occiput white in juveniles *C. hippocrepis*
- 2b. Subcaudals 31-41 (males), 25-38 (females); maxillary teeth 15-19 + II; temporal mark absent, only the most posterior infralabial pigmented; occiput not white in juveniles *C. degeni*

SYSTEMATICS

Crotaphopeltis hotamboeia (Laurenti, 1768)

Coronella hotamboeia Laurenti, 1768: 85 (Description based on fig. 6, plate xxxiii in Seba [1734]).

TYPE LOCALITY. — “India orientali”, in this case Africa.

Leptodira rufescens Gmelin, 1789: 1094 (Description based on fig. 6, plate xxxiii in Seba [1734]). — Mocquard 1896: 45.

Crotaphopeltis hotamboeia hotamboeia – Loveridge 1937: 276. – Roux-Esteve 1965: 68.

Crotaphopeltis hotamboeia – Joger 1990: 95 (part).

DIAGNOSIS

An African savanna living species of *Crotaphopeltis* with the following character combination: (17) 19 (21) scale rows at mid-body, dorsal scales keeled, at least posteriorly; 12-18 + II + 1 maxillary teeth; 31-57 (male) and 25-51 (female) subcaudals; hemipenis extending to subcaudal scute No. seven to fourteen and provided with three distinctly enlarged, stout, proximal spines; dorsum various shades of grey, brown, olive or black, usually with scattered white specks which may form transverse bands in juveniles and subadults, temple with a dark, bluish-black or purplish-black mark which may extend backwards to encircle the occiput and reach the last, or the last and penultimate, and rarely also the antepenultimate infralabial; venter and underside of tail white, cream or pale brown, exceptionally with some dark pigmentation.

DESCRIPTION OF SPECIMENS FROM THE CENTRAL AFRICAN REPUBLIC

Lepidosis

Rostral 1.4 to 2.3 times as broad as deep, usually in broad contact with internasals; frontal 1.3 to 1.9 times as long as broad (Table 1), 1.0 to 1.6 time as long as its distance from end of snout, and 1.1 to 1.6 time as long as the suture between the parietals; one loreal, usually longer than deep; one preocular, two postoculars (for variation see Table 1); usually 1 + 2 temporals (for variation see Table 1); usually eight supralabials, third to fifth usually entering orbit (for variation see

Table 1); usually 10 infralabials, first five on each side usually in contact with an anterior chin-shield (for various combinations see Table 1); three to four rows of chin-shields and enlarged median gulars (for variation see Table 1), followed by one to three preventrals.

Dorsal scales keeled with well defined single or double apical pits, the latter being mainly confined to the flanks. Scale row formula (body) 17-19-15 shared by most of the specimens (for variation see Table 1). Scale row reduction formula (tail) as follows:

8 (1-6) - 6 (4-17) - 4 (12-33) - 2 (32-46) male (n = 100) and 8 (1-5) - 6 (3-12) - 4 (9-28) - 2 (29-41) female (n = 135)

Ventrals rounded, 157-180 in male (n = 99), and 156-176 in female (n = 135); anal entire; subcaudals paired, 36-48 in male (n = 96), 33-44 in female (n = 129).

Dentition

Maxillary teeth 14-17 + II + 1 (x = 15.5, s = 0.7, n = 102); palatine teeth 10-11 (x = 10.7, s = 0.4, n = 30). No sexual difference in either count.

Dimensions

Largest male 79 cm; largest female 68 cm; smallest specimen (with umbilical scar) 15 cm.

Hemipenes

In situ the organs extend to SC No. 7-10 (x = 8.7, s = 1.0, n = 41). The hemipenes are characterised by three enlarged spines at the lower truncus.

Internal morphology

Tongue sheath extending to ventral scute (VS) No. 15-21 in male (n = 45), 13-19 in female (n = 44), giving relative position 8.8-12.5% VS in male and 8.0-11.2% VS in female.

Tip of heart extending to ventral scute No. 32-38 in male (n = 50), 31-39 in female (n = 45), giving relative positions 18.8-21.9% VS in male and 18.4-22.7% VS in female. Trachea extending to heart tip or up to 1 VS posterior to the heart. Left lung 1-3 VS long.

Anterior end of liver situated at VS No. 39-50 in male (n = 50) and 39-47 in female (n = 40),

TABLE 1. — Variation in frontal index and number of preoculars, postoculars, supralabials (number in parentheses: supralabials in contact with eye), infralabials (number in parentheses: number of infralabials on each side in contact with the anterior chin-shield), temporals (primary + secondary [+ tertiary]), chin-shields, and dorsal scale rows. For labials and temporals, each side of the head has been scored separately. Owing to damage, some specimens are not scored for all characters.

Frontal index	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
<i>C. hotamboeia</i>	–	17	48	66	44	19	7	1
<i>C. degeni</i>	–	5	9	2	–	–	–	–
<i>C. hippocrepis</i>	5	24	36	27	13	2	–	–

Preoculars	1/1	1/2 or 2/1	2/2
<i>C. hotamboeia</i>	257	–	1
<i>C. degeni</i>	20	1	–
<i>C. hippocrepis</i>	136	2	2

Postoculars	1/1	2/1	1/2 or 2/2	2/3 or 3/2	3/3
<i>C. hotamboeia</i>	1	–	256	1	–
<i>C. degeni</i>	1	–	20	–	–
<i>C. hippocrepis</i>	–	1	133	4	2

Supralabials	7 (3-4)	8 (3-5)	8 (4-5)	9 (3-5)	9 (4-6)	9 (5-6)
<i>C. hotamboeia</i>	3	425	69	5	12	1
<i>C. degeni</i>	–	29	12	–	1	–
<i>C. hippocrepis</i>	4	228	37	5	1	–

Infralabials	8 (4)	9 (4)	9 (5)	10 (4)	10 (5)	11 (4)	11 (5)	11 (6)	12 (5)
<i>C. hotamboeia</i>	–	24	14	21	411	–	27	13	–
<i>C. degeni</i>	–	4	4	4	28	–	1	–	–
<i>C. hippocrepis</i>	2	28	–	84	134	2	15	1	1

Temporals	1+1	1+2	1	2	2+2	1+1+1	1+1+2	2	1+2+2	1+3+3
			1+2	1+1				1+1+1		
<i>C. hotamboeia</i>	4	483	4	4	3	–	15	–	2	–
<i>C. degeni</i>	–	35	1	2	–	–	2	–	–	2
<i>C. hippocrepis</i>	12	231	6	6	–	4	15	1	6	–

Chin-shields	3/3	3/4 or 4/3	4/4	4/5 or 5/4	5/5	6/6
<i>C. hotamboeia</i>	171	34	47	–	–	–
<i>C. degeni</i>	2	1	15	–	2	–
<i>C. hippocrepis</i>	24	13	96	4	1	1

Dorsal scale rows	15-19-13	16-19-15	17-19-13	17-19-14	17-18-15	17-19-15	17-19-17	18-17-15	18-19-15	19-19-15
<i>C. hotamboeia</i>	–	–	1	–	1	227	1	1	5	12
<i>C. degeni</i>	–	–	–	–	1	20	–	–	–	–
<i>C. hippocrepis</i>	1	2	3	12	–	111	–	–	–	–

giving relative position 23.1-27.9% VS in male and 23.6-28.7% VS in female. Absolute distance heart tip to anterior end of liver 6-14 VS in male and 6-12 VS in female.

Right kidney longer than left one; absolute length (right/left) 22-33/18-28 VS in male (n = 26) and 20-28/19-24 VS in female (n = 18) giving relative lengths 13.5-19.5/10.6-16.7% VS in male and 11.9-17.0/11.3-14.5% VS in female. Anterior end of kidneys situated at VS No. 122-140/128-145 in male, 125-142/130-144 in female, giving relative position 76.8-82.4/79.8-85.4% VS in male and 78.6-84.5/81.8-85.7% VS in female. Posterior ends of kidneys situated at VS No. 152-168/152-168 in male and 152-165/153-166 in female, giving relative position 94.1-97.1/94.7-97.7% VS in male and 93.9-97.1/94.5-97.7% VS in female.

Anal glands extending to subcaudal scute No. 2-4 (x = 3.1, s = 0.4, n = 29) in male and to 3-5, (x = 4.1, s = 0.6, n = 36) in female.

Coloration (in life)

Dorsum yellowish grey, shading paler until one scale row above ventrals; when body is inflated, white spots on base of some of the scales form indistinct, irregular transverse bands; temple black with a metallic bluish hue which may extend backwards to encircle the occiput and reach the last, or the last and the penultimate, and rarely also the antepenultimate infralabial. Venter and underside of tail dirty white. Lips white in juveniles, the supralabials being overlaid by pigmented areas with increasing size of specimens, often leaving only the fifth and the sixth supralabial with a central white area.

Coloration (in preservative)

Dorsum various shades of grey or brown, usually with scattered white specks which may form transverse bands in juveniles and subadults; temple with a dark grey or bluish-black mark which may extend backwards to encircle the occiput and reach the last, or the last and penultimate, and rarely also the antepenultimate infralabial. Venter and underside of tail white, cream or yellowish, tail occasionally with a pigmented

median stripe. Lips white or pale cream in juveniles, the supralabials being overlaid by pigment with increasing size of specimens.

Biology

Crotaphopeltis hotamboeia has eyes of moderate to large size (greatest horizontal diameter of the eye 0.7-1.0 [x = 0.8, s = 0.1, n = 68] time length of snout) and vertical pupils, thus indicating a nocturnal way of life as in other *Crotaphopeltis* species. In the Central African Republic *C. hotamboeia* occurs in Guinean and Sudanian savannas where it lives sympatrically with *C. hippocrepis*. It also occurs in Sudano-Sahelian areas where it is sympatric with *C. degeni*. The Herald Snake predominantly preys upon frogs but may take geckos and other lizards.

By palpating bellies of gravid females (n = 3), four to ten eggs per female have been registered.

Distribution

Crotaphopeltis hotamboeia is distributed in tropical Africa (excluding rain forest areas), south over the eastern half of southern Africa to the western Cape Province, but absent from the dry western half of southern Africa; found from sea-level up to altitudes of nearly 2 000 metres (Broadley 1983). In the Central African Republic it was recorded from all the collection sites at Fig. 1, but is most common in the humid lower parts of the country.

Localities and material examined

Central African Republic. Abiras (Mocquard 1896), MNHN 1895.335. — Am Dafok, MNHN 1996.6496. — Bambari, MNHN 1992.4651-53, 1994.3259, 1997.3511. — Bamingui, MNHN 1997.3512. — Banga, MNHN 1997.3513. — Bangbali, MNHN 1996.6497. — Bangui (Joger 1990), MHNG 2033.86-87; MNHN 1991.317, 1992.4626, 1994.7377-80. — Bayanga, MNHN 1991.314, 1996.6498. — Belemboké, MNHN 1994.3260-61, 1996.6499-6504, 1997.3514-15. — Berberati, MNHN 1994.7381-83, 1994.3262-65, 1996.6505-06, 1997.3516. — Birao, MNHN 1994.3266-67, 1996.6507-12, 1997.3517-20. — Boali, MNHN 1992.4588, 1994.3268-71, 1994.7384-87, 1996.6513. — Bohou, MNHN 1998.224. — Bossangoa, MNHN 1992.4578, 1994.7388-91, 1994.7393-7400, 1994.7402-04. — Bossembélé, MNHN 1997.3521. — Boukoko (Roux-

Estève 1965), MNHN 1964.473-84. — Brandji-Préo, MNHN 1996.6514. — Bria, MNHN 1996.6515. — Dahal Azrak, MNHN 1996.6516-17. — Delembé, MNHN 1996.6518-21, 1998.225. — Elim, MHNG 2235.67. — Gamboula, MNHN 1994.3272. — Gordil, MNHN 1996.6522-23, 1998.227-28, 1998.489. — Gribingui (Joger 1990), MNHN 1921.18. — Kaga Bandoro (Fort Crampel), MCZ 55419; MNHN 1998.250, 1998.252-53. — Kouki, MNHN 1992.4687, 1994.3277, 1994.3284-87, 1994.7405-09, 1994.7412-18, 1994.7420-22, 1994.7425-26, 1994.7428-36, 1994.7439-41, 1994.7443-46. — La Gounda, MNHN 1992.4576-77, 1994.7447-50, 1998.226. — La Maboké (Roux-Esteve 1965), MNHN 1963.883. — Manovo, MNHN 1998.490. — Mboki, MNHN 1994.3288. — Ndélé, MNHN 1996.6523-24. — Ngotto, MNHN 1996.6525-27. — Nola (Loveridge 1937), MCZ 52138. — Ouanda-Djalle, MNHN 1996.6528. — Ouazoua, MNHN 1996.6529. — Ouham region, MNHN 1922.75-77. — Paoua, MNHN 1992.4583, 1992.4589-92, 1994.3289-93, 1994.7451-64. — Route de Possel (route de Bangui à Sibut), MNHN 1992.4580. — Sangba, MNHN 1994.3328, 1994.3516, 1994.8160, 1996.6530, 1996.6535-38, 1997.3505-06, 1997.3509, 1997.3548, 1997.3597-3602, 1998.240-49, 1998.491-492. — Seko, MNHN 1994.3294-95, 1996.6533. — Sibut (Krebedje), MNHN 1904.197. — Sogesca (S. of Bambari), MNHN 1992.4587. — Soumba, 1994.3296-98. — Zimba, MNHN 1991.313, 1992.4579, 1992.4581-82, 1992.4584-86, 1992.4633-39, 1994.7465-68, 1994.3299-306, 1996.6534.

REMARKS

A thorough revision of this almost Panafrikan species is being undertaken (Rasmussen in prep.).

Crotaphopeltis degeni (Boulenger, 1906)

Leptodira degeni Boulenger, 1906: 572.

SYNTYPES. — Entebbe, Uganda, 1 male and 1 female respectively (BMNH 1946.1.9.96-97).

Crotaphopeltis degeni Barbour & Amaral 1927: 26. — Rasmussen 1997: 192 (review).

DIAGNOSIS

A semiaquatic species of *Crotaphopeltis* of the Central African Plateau with the following character combination: 19 scale rows at mid-body, dorsal scales smooth all over the body; 15-19 + II maxillary teeth; 31-41 (male) and 25-38

(female) subcaudals; hemipenis extending to subcaudal scute No. 7-11 and usually provided with five enlarged spines proximally; dorsum dark brown, grey or almost black, no white specks or temporal marks, pigment on lower jaw usually restricted to the last infralabial; venter cream or pale yellowish; underside of tail whitish, with a more or less distinctly pigmented, median stripe, usually but not always, starting just behind the anal shield.

DESCRIPTION OF SPECIMENS

FROM THE CENTRAL AFRICAN REPUBLIC

Lepidosis

Rostral 1.7-2.0 times as broad as deep, in narrow contact with internasals; frontal 1.3-1.5 time as long as broad (see Table 1), 1.0-1.2 time as long as its distance from end of snout, and 0.9-1.1 time as long as suture between parietals; one loreal, distinctly longer than deep, in contact with eye below preocular on left side in one specimen; one preocular, rarely two (Table 1); two postoculars, rarely one (Table 1); usually 1 + 2 temporals (for variation see Table 1); usually eight supralabials, third to fifth usually entering orbit (for variation see Table 1); usually 10 infralabials, first five on each side usually in contact with an anterior chin-shield (for various combinations see Table 1); three to five pairs of chin-shields and enlarged median gulars (for variation see Table 1) followed by zero to four prementals. Dorsal scales smooth with well defined single or double apical pits. Scale row formula of the body usually 17-19-15. Scale row reduction formula (tail) as follows:

8 (3-5) - 6 (5-13) - 4 (15-25) - 2 (26-41) male (n = 11) and 8 (2-5) - 6 (5-8) - 4 (12-20) - 2 (29-35) female (n = 10).

Ventrals rounded, 161-173 in male (n = 11), and 163-172 in female (n = 10); anal entire; subcaudals paired, 31-41 in male (n = 10), and 31-37 in female (n = 10).

Dentition

Maxillary teeth 14-16 + II (x = 15.6, s = 0.7, n = 21); palatine teeth 10-12 (x = 11.0, s = 0.3, n = 19). No sexual dimorphism in either count.

Dimensions

Total length of largest male 65 cm; largest female 60 cm.

Hemipenes

In situ the organs extend to subcaudal scute No. 8-10 ($x = 8.8$, $s = 0.6$, $n = 10$). In everted condition the hemipenes of specimens from the nearby Sudan are characterised by the possession of up to six enlarged spines at the lower truncus (Rasmussen 1997).

Internal morphology

Tongue sheath extending to ventral scute (VS) No. 15-16 in male ($n = 10$), 12-14 in female ($n = 10$), giving relative position 8.7-9.9% VS in male and 7.2-8.3% VS in female.

Tip of heart extending to ventral scute No. 33-35 in male ($n = 10$), 33-37 in female ($n = 10$), giving relative positions 20.2-21.2% VS in male and 19.8-21.5% VS in female.

Anterior end of liver situated at VS No. 43-46 in male ($n = 9$) and 40-46 in female ($n = 10$), giving relative position 25.8-27.5% VS in male and 24.5-27.0% VS in female. Absolute distance heart tip to anterior end of liver 9-11 VS in male and 6-10 VS in female.

Right kidney longer than left; absolute length (right/left) 22-27/17-22 VS in male ($n = 7$) and 19-25/16-20 VS in female ($n = 7$), giving relative lengths 13.7-16.1/10.6-13.1% VS in male and 11.4-15.0/9.5-12.3% VS in female. Anterior end of kidneys situated at VS No. 131-136/137-142 in male, 133-142/137-147 in female, giving relative position 79.8-82.0/82.7-85.7% VS in male and 80.8-85.0/84.1-87.5% VS in female. Posterior ends of kidneys situated at VS No. 154-161/155-162 in male and 156-165/157-166 in female, giving relative position 95.2-95.8/95.8-96.4% VS in male and 95.7-96.5/96.3-97.1% VS in female.

Anal glands extending to subcaudal scute No. 3-5 in male ($x = 3.7$, $s = 0.7$, $n = 9$) and to 4-5 in female ($x = 4.3$, $s = 0.5$, $n = 10$).

Coloration (in life)

Dorsum uniform slate grey, belly and underside of tail white, a pale yellow line separating dorsal

and ventral colours. Temporal region, including last two supralabials and the last infralabial, same colour as upper side of head.

Coloration (in preservative)

Dorsum grey-brown, grey or almost black. Belly and lower row of dorsals whitish or pale cream, underside of tail whitish with a more or less distinctly pigmented, median stripe which usually, but not always, begins just behind the anal scale. Lips white or pale cream, supralabials and posterior infralabial becoming pigmented with increasing size.

Biology

Crotaphopeltis degeni has eyes of moderate size (greatest horizontal diameter of eye 0.6-0.8 [$x = 0.7$, $s = 0.1$, $n = 15$] time length of snout) and vertical pupils, thus indicating a nocturnal way of life as in other *Crotaphopeltis* species. The eyes, however, are smaller than in the two other species of the country.

In Central African Republic *C. degeni* occurs in the Sudano-Sahelian savanna where it lives sympatrically with *C. hotamboeia*. A female measuring 50 cm contained six eggs. The few facts known about its habitats were recently described by Rasmussen (1997).

Distribution

Crotaphopeltis degeni has a disjunct distribution in Ethiopia, Sudan, Uganda, Kenya, Tanzania, Cameroon and in the eastern part of Central African Republic (Fig. 2).

Localities and material examined

Central African Republic. Am Dafok, MNHN 1996.6494, 1997.3523-28, 1998.229-39. — Birao, MNHN 1997.3529-30. — Dahal Azrak (near Dahal Hadjer), MNHN 1996.6495.

Geographical variation

Rasmussen (1997) compared the various populations of *C. degeni*; however, only two of these were well-represented, i.e. the Kenyan and the Sudan populations. With respect to the number of ventrals, the specimens from Central African

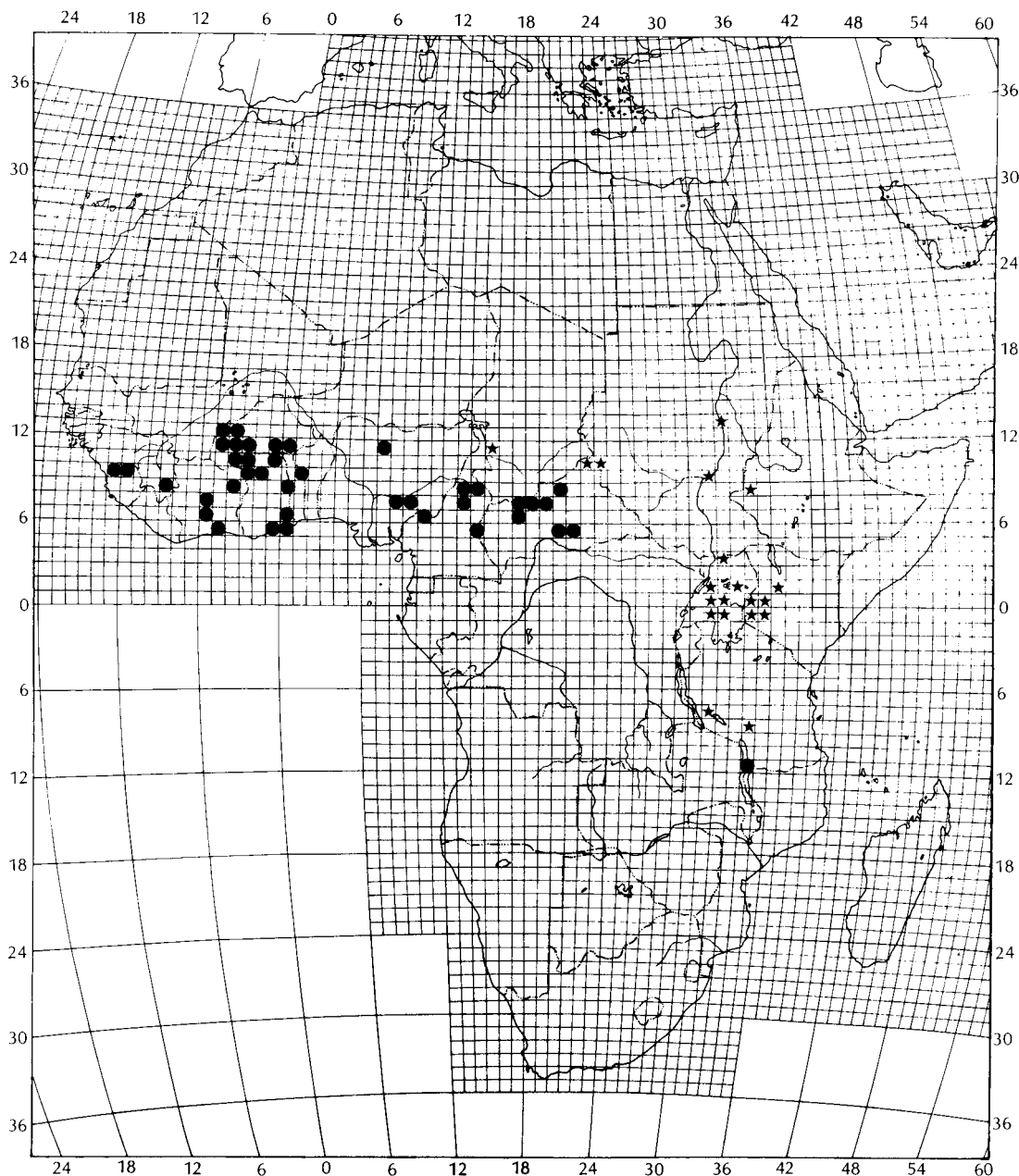


FIG. 2. — Distribution of *Crotaphopeltis degeni* (★) and *Crotaphopeltis hippocrepis* (●). Regarding the Tanzanian record of *C. hippocrepis*, see text.

Republic have intermediate values compared to these countries; in males this is also the case with respect to the number of subcaudals, whereas the

females have values similar to those of the Sudan population. The number of maxillary teeth and relative position of heart in both sexes have values

lower than those in the populations of Sudan and Kenya. The present findings thus seem to support the view that much of the variation of the various characters in this species is discordant.

REMARKS

The distribution of *C. degeni* is somewhat similar to the bizarre and seemingly disjunct distribution of *Causus resimus* Peters, 1862 (Spawls & Branch 1995).

Crotaphopeltis hippocrepis (Reinhardt, 1843)

Dipsas hippocrepis Reinhardt, 1843: 26.

HOLOTYPE. — 1 juvenile female from the Danish settlements on the coast of Guinea, near Accra, Ghana (ZMUC R63127).

Heterurus hippocrepis – Duméril *et al.* 1854: 1177.

Leptodeira hippocrepis – Gray 1858: 161.

Leptodira hotamboeia (not Laurenti) – Boulenger 1896: 90 (synonymised *D. hippocrepis* with *L. hotamboeia*).

Crotaphopeltis hotamboeia (not Laurenti) – Chabanaud 1921: 469 (part). – Balletto *et al.* 1973: 92 (part). – Hughes 1983: 348 (part). – Joger 1990: 95 (part).

Crotaphopeltis hotamboeia hotamboeia (not Laurenti) – Angel 1933: 148 (part). – Monard 1951: 163 (part).

Crotaphopeltis hotamboeia hotamboeia [sic] – Roux-Estève 1969: 114 (part).

Crotaphopeltis acarina Roman, 1974: 6; 1980: 53; 1984: 39. – Rasmussen 1979: 99. – Joger 1982: 333. – Welch 1982: 147.

HOLOTYPE. — H-V 4780, 1 adult specimen from Tionkuy, Burkina-Faso.

Crotaphopeltis hippocrepis – Rasmussen 1985: 126. – Böhme & Schneider 1987: 259. – Hughes 1988: 34. – Rödel *et al.* 1995: 8. – Rasmussen & Hughes 1997: 22.

DIAGNOSIS

A West and Central African savanna species of *Crotaphopeltis* with the following character combination: 19 scale rows at mid-body, scales in more or less oblique rows anteriorly, smooth all over the body; 12-16 + II + 1 maxillary teeth; 44-58 (male) and 39-54 (female) subcaudals; hemipenis extending to subcaudal scute No. 8-12 and provided with two enlarged spines proximally; dor-

sum various shades of brown, without white specks; occiput white in juveniles; temples with a dark brown mark extending to posterior jaw, covering the last two to five infralabials with pigment; venter and underside of tail white, cream or yellowish, latter often with median stripe.

DESCRIPTION

Lepidosis

Rostral 1.5-2.2 times as broad as deep, usually in broad contact with internasals; frontal 1.2-1.7 time as long as broad (Table 1), and 1.0-1.6 time as long as its distance from end of snout, and 0.9-1.5 time as long as suture between parietals; loreal usually one (two on one side in three specimens), normally deeper than long; preocular usually one (Table 1), in one case in contact with frontal; postoculars usually two (for variation see Table 1); temporals usually 1 + 2 (for variation see Table 1); supralabials usually eight, third to fifth usually entering orbit (for variation see Table 1); infralabials usually ten, first five on each side usually in contact with an anterior chinshield (for various combinations see Table 1); chin-shields and enlarged median gulars in three to six pairs followed by zero to two preventrals. Dorsal scales often arranged in oblique rows anteriorly, smooth with well-defined single, rarely double, apical pits, the latter being mainly confined to the flanks. Scale row reduction formula (body) of the type as follows:

$$\begin{array}{rcc} +p(24) & 8+p(106) & 3+4(108) \\ \underline{17} & \underline{19} & \underline{17} & \underline{15} \\ +p(24) & p+v(106) & 3+4(106) \end{array}$$

giving the standard count 17-19-15 shared by more than 80% of the specimens (see Table 1 for variation). Scale row reduction formula (tail) as follows:

8 (1-4) - 6 (3-12) - 4 (14-29) - 2 (34-57) male (n = 60)

and

8 (1-4) - 6 (2-8) - 4 (7-22) - 2 (28-48) female (n = 61)

Ventrals smooth 163-181 in male (n = 60), and 166-187 in female (n = 65); anal entire; subcau-



FIG. 3. — *Crotaphopeltis hippocrepis*, everted left hemipenis of BMNH 1982.439 from sulcate and asulcate sides; specimen from Wa, Ghana. Scale bar: 5 mm. Drawing Robert Nielsen.

dals paired, 44-58 in male (n = 63), 39-54 in female (n = 64).

Dentition

Maxillary teeth 12-16 + II + 1 (x = 14.6, s = 0.8, n = 51) in male, 13-16 + II + 1 (x = 14.2, s = 0.8, n = 52) in female, i.e. a small but significant (p < 0.05) sexual dimorphism in number of solid maxillary teeth as in *Dipsadoboa unicolor* Günther, 1858 (Rasmussen 1996). Palatine teeth 8-11 (x = 10.3, s = 0.7, n = 49), no sexual dimorphism.

Dimensions

Total length of type (female) 24 cm. Largest male 75 cm; largest female 70 cm; smallest specimen (with umbilical scars) 16 cm.

Hemipenes

In situ the organs extend to subcaudal scute No. 8-12, (x = 10.1, s = 1.1, n = 38). In everted condition the hemipenes are characterised by two enlarged spines at the lower truncus, each with a

row of accessory spines decreasing in size towards tip (Fig. 3).

Internal morphology

Tongue sheath extending to ventral scute (VS) No. 15-21 in male (n = 38), 15-22 in female (n = 41), giving relative position 8.5-12.4% VS in male and 8.2-12.4% VS in female.

Tip of heart extending to ventral scute No. 34-42 in male (n = 44), 35-40 in female (n = 47), giving relative position 19.9-24.0% VS in male and 19.4-23.1% VS in female. Trachea extends to heart tip or up to 2 VS posterior to heart. Left lung 1-2 VS long.

Anterior end of liver situated at VS No. 45-51 in male (n = 41) and 42-51 in female (n = 45), giving relative position 25.3-29.6% VS in male and 23.1-28.7% VS in female. Absolute distance heart tip to anterior end of liver 7-13 VS in male and 6-13 VS in female.

Right kidney longer than left one; absolute length (right/left) 24-33/21-29 VS in male (n = 35) and 21-31/17-27 VS in female (n = 36), giving

relative lengths 13.8-19.4/11.8-16.8% VS in male and 11.8-17.9/9.3-15.6% VS in female. Anterior end of kidneys situated at VS No. 130-146/136-151 in male, 134-152/140-159 in female, giving relative position 76.5-82.0/79.8-84.9% VS in male and 78.1-84.0/80.9-86.9% VS in female. Posterior ends of kidneys situated at VS No. 161-173/162-174 in male and 160-180/161-181 in female, giving relative position 95.3-97.7/95.9-97.8% VS in male and 94.9-98.9/95.4-97.7% VS in female.

Anal glands extending to subcaudal scute No. 3-5 ($x = 3.6$, $s = 0.6$, $n = 25$) in male and to 3-5, ($x = 4.4$, $s = 0.6$, $n = 36$) in female.

Coloration (in life)

Dorsum dull chestnut, growing a little paler ventrally. Central part of each scale slightly paler than edge. Belly uniform whitish. Each side of head with dark chestnut band extending to posterior infralabials (Roman 1974).

Coloration (in preservative)

Dorsum various shades of brown, often chestnut, without white specks. Venter and underside of tail white, cream or yellowish, tail often with a pigmented median stripe. Occiput in juveniles either covered by two white parallel bars or by a horseshoe mark (Fig. 4) which is overlaid by pigment in adults. Temples with a dark brown to black mark extending to lower jaw, covering most posterior two to five infralabials (Roman 1980: 52, upper figure). Upper labials pale in juveniles, gradually being overlaid by pigment with increasing size of specimens.

Biology

Crotaphopeltis hippocrepis has eyes of moderate to large size (greatest horizontal diameter of the eye 0.7-1.1 [$x = 0.9$, $s = 0.1$, $n = 79$] time the length of the snout and vertical pupils thus indicating a nocturnal way of life as in its congeners.

Crotaphopeltis hippocrepis occurs in moist (Guinean) savannas with more than 900 mm precipitation annually (Roman 1980); however, it also lives in drier (Sudanian) savanna in the Central African Republic and also in coastal thickets in

Ghana (Hughes 1988). Apparently it mainly preys upon anurans, as only such food items are found in their intestines ($n = 3$), apart from a single juvenile specimen with some ants (which primarily may have been eaten by an anuran)!

By palpating bellies of gravid females ($n = 3$), four to ten eggs have been registered.

Distribution

Crotaphopeltis hippocrepis is known from Guinea, Sierre Leone, Ivory Coast, Burkina-Faso, Ghana, Togo, Benin, Nigeria, Cameroon and the Central African Republic (Fig. 2). Two records from East Africa, i.e. Victoria Nyansa (MCZ 6258) and Ugano in Matengo Hochland, Tanzania (NMW 25542:7), respectively, need confirmation (see Remarks).

Localities and material examined

Guinea. No specific locality, MHNG 722.95. — Beyla (Chabanaud 1921), MNHN 1921.462-463.

Sierre Leone. Saniya, USNM 248844. — Musaiya, BMNH 1963.1056.

Ivory Coast. Adiopodume, MHNG 1565.9. — Bowake, FMNH 154659; MNHN 1987.1802-03. — Kotiessou, MNHN 1962.546. — Lamto (Roux-Estève 1969), MHNG 1464-65; MNHN 1977.383-84, 1977.386-87, 1977.389, 1977.393, 1977.395-97, 1977.399-400, 1977.402-03, 1977.406, 1977.415-16, 1977.418, 1992.4323, 1993.1771, 1993.3421, 1993.3442, 1993.7297, 1993.7299, 1994.7297, 1994.7299. — Nassian (Balletto *et al.* 1973), MSNG 44151. — Sakassou (near Toumodi), MHNG 1565.7.

Burkina Faso. Balave (Roman 1974). — Bomborokoy (Roman 1974). — Boromo (Roman 1974). — Danou (Roman 1974). — Farakoba, MHNG 1579.14. — Kampti (Roman 1974). — Nouna (Roman 1974). — Ouargaye (Roman 1974). — Ouarkoyo (Roman 1974). — Safane (Roman 1974). — Satiri (Roman 1974). — Sibi (Roman 1974). — Tionkuy (Roman 1974). — Zakuy (Roman 1974).

Ghana. No specific locality, ZFMK 63801, 63882-83. — Accra SMNS 2864; ZMUC R63127, R63276. — Accra (5 mls E), CAS 125475. — Achimote, BMNH 1932.9.1.3; CAS 97515; FMNH 74847-49; MCZ 53709-10; ZFMK 63774-75. — Afienea (6 mls SW), CAS 125472. — Akosombo, ZFMK 63828. — Bombi Forest Reserve (near Damongo), ZFMK 63794. — Kpong ZFMK 63763. — Kwabenyan, BH C7H 165; ZFMK 63830. — Legon Hill, MCZ 53307; ZFMK 63751-58, 63764-65, 63773, 63880; ZMUC R631238. — Mole National Park, ZFMK 63831. — Nalerigu, ZFMK 63829. — Nungua Farm, ZFMK 63881. —

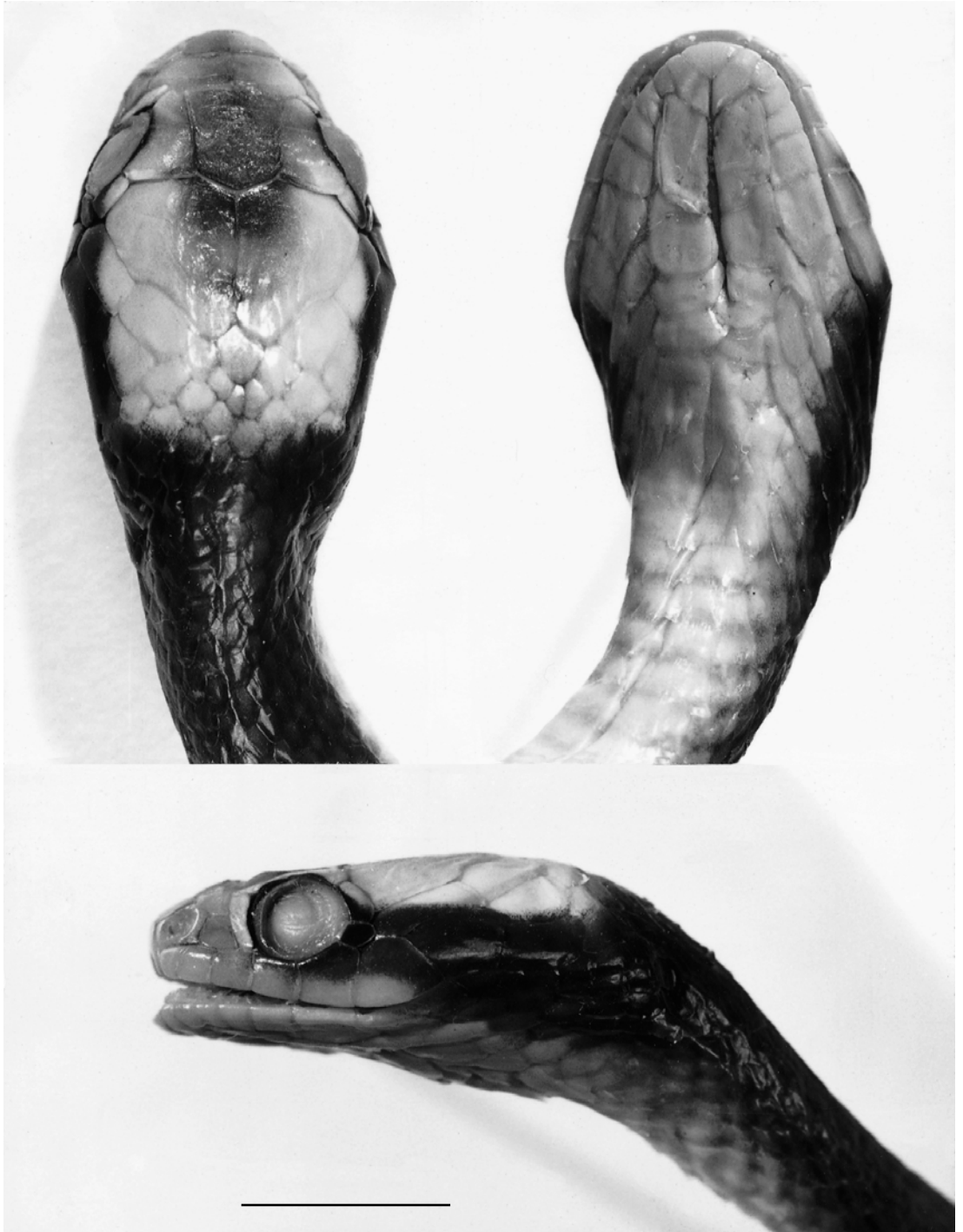


FIG. 4. — *Crotaphopeltis hippocrepis*, juvenile (BMNH 1932.9.1.3) showing white occiput. Scale bar: 5 mm. Photo Geert Brovad.

Shishe, USNM 223930. — Wa, BH C7H 188; BMNH 1982.439; ZFMK 63875-79, 63884-85; ZMUC R631239. — Zawse-Bawku, ZFMK 63793. **Togo.** Bismarcksburg, ZMB 21346. — Pagala, USNM 223867.

Benin. Soubroukou, USNM 223778-79.

Nigeria. Northern part, BMNH 1975.623. — Makurdi, BMNH 1937.12.4.52-56. — Samaru, BMNH 1975.621. — Wukari, BMNH 1938.3.1.122, 1938.3.1.124-33.

Cameroon. Bafout (Joger 1982; Böhme & Schneider 1987). — Boli (near Garoua), MCZ 44107. — Garoua-Boulai, MHNG 1461.63. — Banguve, 15 km from Ngaouyanga (Monard 1951). — Ngaouyanga (Monard 1951). — Tchollire (Joger 1982; Böhme & Schneider 1987).

Central African Republic. Bangbali, MNHN 1997.3522. — Bossangoa, MNHN 1994.7392, 1994.7401. — Gribingui River (Mocquard 1896; Joger 1990), MNHN 1921.19. — Kaga Bandoro (Fort Crampel), MNHN 1998.251. — Kouki, MNHN 1994.3273-76, 1994.3278-83, 1994.7410-11, 1994.7419, 1994.7423-24, 1994.7427, 1994.7437-38, 1994.7442. — Seko, MNHN 1996.6531-32. Sogesca (South of Bambari), MNHN 1992.4618.

Victoria Nyansa. MCZ 6258.

Tanzania. Ugano (Matengo Hochland), NMW 25542: 7.

Geographical variation

Populations from only four countries are reasonably well-represented. With respect to number of ventrals, the males exhibit a smooth east-west cline with decreasing numbers of ventrals (Table 2). The females, however, have an increasing number of ventrals until Ghana and then low counts for the Ivory Coast (Table 2).

With respect to subcaudals, the highest numbers in both sexes are found in Nigeria from where they declines eastwards and westwards (Table 3). With respect to number of solid maxillary teeth, the highest numbers in males are found in Nigeria as well, whereas the females exhibit a smooth east-west cline with decreasing numbers of maxillary teeth (Table 4).

As to the relative position of the heart, both sexes have highest values in Nigeria, i.e. the heart is more posteriorly positioned (Table 5).

In opposition to two other species within the genus (*C. degeni* and *C. tornieri*), the distribution of *C. hippocrepis* seems to be reasonably continuous and the variation only of a small scale, making *C. hippocrepis* a homogeneous entity.

REMARKS

The two East African records of this species seem dubious. José P. Rosado (*in litt.*) kindly informs the senior author that the specimen from Victoria Nyansa was “purchased from the Linnean Natural History Institute in 1889 [...] and that many of the catalogue entries during that period have been rejected (discarded) for bad locality information”. (The Linnean Natural History Institute is probably the same as the one Gans [1966: 232] mentions, i.e. a commercial trading concern which purchased collections, arranged for them to be identified by specialists, and then sold their components to various museums).

Loveridge (1942) examined the series of which the specimen from Ugano, Matengo Hochland, is supposed to be a part. According to Loveridge, seven specimens were examined, one of which was exchanged with Harvard, leaving six specimens in Vienna. Nonetheless the catalogue in Vienna today reads that the series comprises eight specimens!

Albeit Loveridge was not especially keen in his use of numerals, it is fairly evident that the present specimen (♀, SC 48/48 + 1, total length 66 cm) was not included in his counts. It is thus possible that the present specimen has not been a part of the original series, but rather of another one.

On the basis of number of ventrals, subcaudals, and maxillary teeth plus the position of the heart, it is possible to assign these two specimens to any of the various populations.

Acknowledgements

We are indebted to the following persons and institutions for making available preserved specimens in their care. Barry Hughes (BH), Colin McCarthy (BMNH), Robert C. Drewes and Jens Vindum (CAS), Harold Voris (FMNH), John E. Cadle and José P. Rosado (MCZ), Beat Schätti (MHNG), Lilia Capocaccia (MSNG), Franz Tiedemann (NMW), Heinz Wermuth and Andreas Schlüter (SMNS), Wolfgang Böhme (ZFMK), and Rainer Günther (ZMB). We also thank José Lobao Tello (Projet de Développement de la Région Nord, CAR) for collecting numerous specimens, Alain Dubois for comments on the manuscript, and Mary E. Petersen for correcting the language.

TABLE 2. — *Crotaphopeltis hippocrepsis*, range of variation in ventral counts for four different populations. **CAR**, Central African Republic.

Population	n	Males			n	Females		
		range	mean	s		range	mean	s
Ivory Coast	13	167-178	172.5	2.7	14	169-182	174.6	4.0
Ghana	22	167-179	173.1	3.4	20	172-186	178.1	3.6
Nigeria	10	172-178	174.5	2.1	8	172-187	177.3	5.0
CAR	9	170-181	176.2	3.7	17	173-185	176.7	4.0

TABLE 3. — *Crotaphopeltis hippocrepsis*, range of variation in subcaudal counts for four different populations. **CAR**, Central African Republic.

Population	n	Males			n	Females		
		range	mean	s		range	mean	s
Ivory Coast	15	40-50	44.1	3.1	15	45-54	50.3	2.7
Ghana	17	39-49	45.2	2.9	23	46-55	50.3	2.5
Nigeria	8	44-54	48.9	3.4	10	50-58	55.2	2.7
CAR	17	42-49	45.5	1.9	9	49-55	51.6	2.2

TABLE 4. — *Crotaphopeltis hippocrepsis*, range of variation in number of solid maxillary tooth counts for four different populations. **CAR**, Central African Republic.

Population	n	Males			n	Females		
		range	mean	s		range	mean	s
Ivory Coast	14	13-16	14.1	0.8	13	13-15	14.0	0.6
Ghana	18	12-16	14.6	1.0	14	13-15	14.4	0.6
Nigeria	9	14-16	15.0	0.5	8	13-16	14.4	1.1
CAR	4	14-15	14.5	0.6	9	14-16	14.6	0.7

TABLE 5. — *Crotaphopeltis hippocrepsis*, range of variation in relative position of heart for four different populations. **CAR**, Central African Republic.

Population	n	Males			n	Females		
		range	mean	s		range	mean	s
Ivory Coast	10	20.6-23.3	21.7	0.9	14	19.6-23.1	21.5	0.9
Ghana	18	19.9-23.4	21.2	0.8	9	19.8-21.9	20.9	0.7
Nigeria	6	22.0-24.0	22.8	0.8	7	20.9-22.5	21.8	0.6
CAR	4	20.7-21.8	21.1	0.5	9	19.4-21.4	20.3	0.6

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Submitted on 10 May 1999;
accepted on 17 November 1999.